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Nonsymbiotic haemoglobins in plants.

Sowa AW, Guy PA, Sowa S, Hill RD.

Plant Breeding and Acclimatization Institute, Radzikow, Blonie, Poland.

General aspects regarding the presence of nonsymbiotic haemoglobin in plants are presented with the emphasis on those related to its function. As it becomes apparent that the nonsymbiotic haemoglobins are widespread across the plant kingdom and that they represent a more primitive and evolutionary older form of the plant globin genes, the question of their function becomes more attractive. While the physiological functions of the symbiotic haemoglobins in plants are well understood, almost nothing is known about their nonsymbiotic predecessors. Therefore, the known and hypothetical functions of haemoglobins in various systems are described along with information concerning properties and the regulation of expression of the nonsymbiotic haemoglobins. Interestingly, a number of nonsymbiotic haemoglobins have been shown to be hypoxia-inducible. The spatial and temporal pattern of this induction in barley may suggest that it is an integral part of the plants response to limiting oxygen stress.

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A nonsymbiotic hemoglobin gene is expressed during somatic embryogenesis in Cichorium.

Hendriks T, Scheer I, Quillet MC, Randoux B, Delbreil B, Vasseur J, Hilbert JL.

Laboratory of Plant Breeding, Agricultural University Wageningen, P. O. Box 386, 6700 AJ Wageningen, The Netherlands.

After differential screening of a cDNA library corresponding to genes expressed during the early stages of somatic embryogenesis in leaf tissue from the Cichorium hybrid '474' (C. intybus L., var. sativumxC. endivia L., var. latifolia) a nonsymbiotic hemoglobin cDNA was obtained. Studies of the expression of the gene corresponding to this clone by Northern blot analysis suggest that in Cichorium a nonsymbiotic hemoglobin gene is specifically expressed under somatic embryogenesis-inducing conditions, and that its expression is not related to stress caused by wounding or tissue culture conditions.

PMID: 9838109 [PubMed - indexed for MEDLINE]

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Symbiotic and nonsymbiotic hemoglobin genes of Casuarina glauca.

Jacobsen-Lyon K, Jensen EO, Jorgensen JE, Marcker KA, Peacock WJ, Dennis ES.

Commonwealth Scientific and Industrial Research Organization, Division of Plant Industry, Canberra, Australia.

Casuarina glauca has a gene encoding hemoglobin (cashb-nonsym). This gene is expressed in a number of plant tissues. Casuarina also has a second family of hemoglobin genes (cashb-sym) expressed at a high level in the nodules that Casuarina forms in a nitrogen-fixing symbiosis with the actinomycete Frankia. Both the nonsymbiotic and symbiotic genes retained their specific patterns of expression when introduced into the legume Lotus corniculatus. We interpret this finding to mean that the controls of expression of the symbiotic gene in Casuarina must be similar to the controls of expression of the leghemoglobin genes that operate in nodules formed during the interaction between rhizobia and legumes. Deletion analyses of the promoters of the Casuarina symbiotic genes delineated a region that contains nodulin motifs identified in legumes; this region is critical for the controlled expression of the Casuarina gene. The finding that the nonsymbiotic Casuarina gene is also correctly expressed in L. corniculatus suggests to us that a comparable non-symbiotic hemoglobin gene will be found in legume species.

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